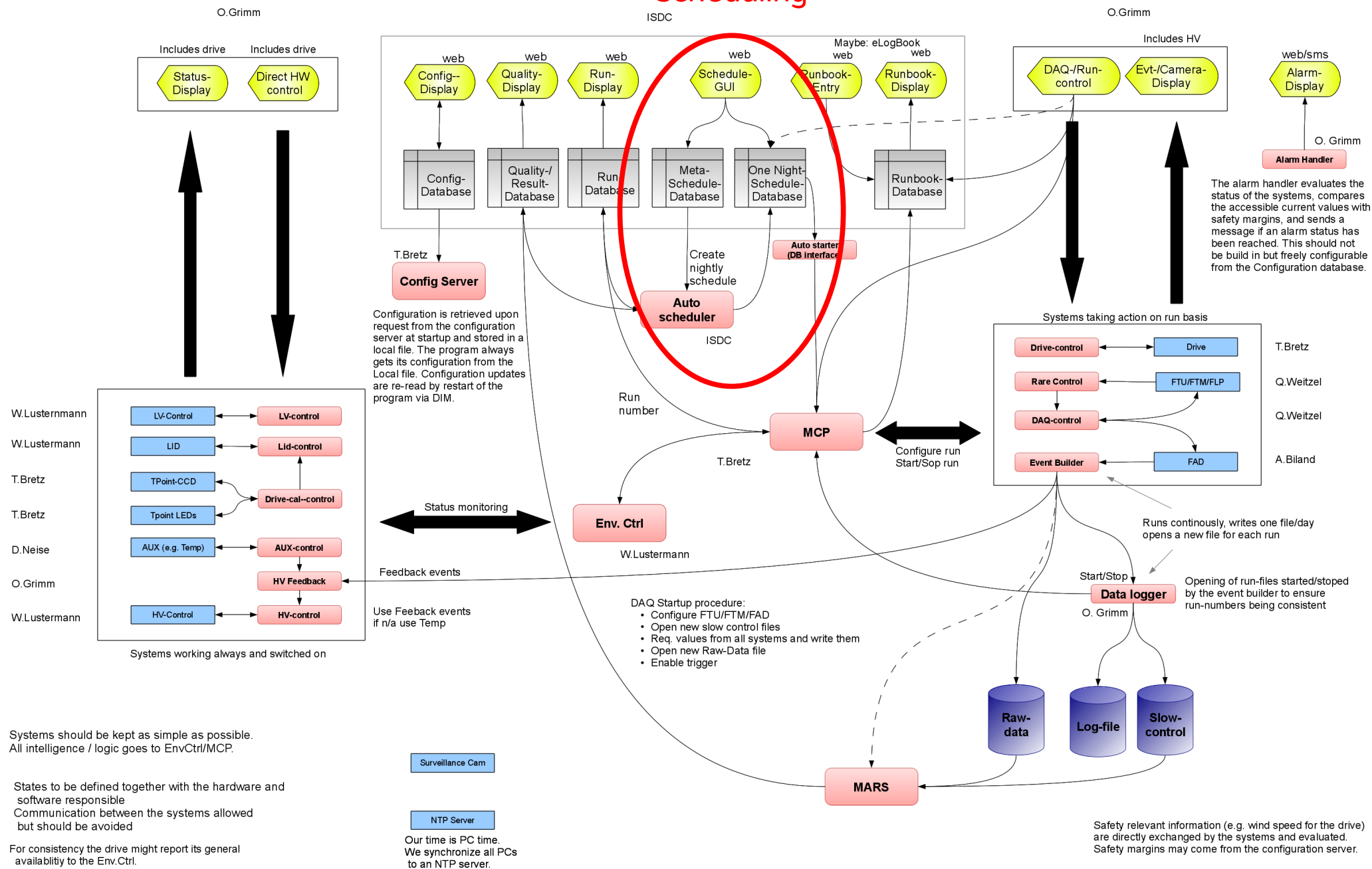


Scheduling Requirements

- overview
- scheme
- requirements
- open questions

scheduling



Use Cases

- user wants to
 - check the meta schedule
 - check the nightly schedule
 - insert / update the meta schedule
 - general: sources to be observed, how long?
 - specific: special observations, e.g.
 - MWL campaign => fixed time range; has priority
 - ToO observation => higher priority than standard observation
 - Crab test measurement => certain configuration, e.g. Z_d

What is the meta schedule?

How is it defined?

- option 1:

- high priority observations:
 - source name
 - start and stop time of observation
- general observation:
 - list of observed sources
 - ratio in which sources should be observed

- option 2:

- for all observations:
 - source name
 - start and stop time of observation
 - duration of observation
 - priority of observation, e.g. defined by observation type

Differences:

two different types of observations described in a different way

same way to describe all observations but needs observations cycles

Input Data

- astronomical sources:
 - name, sky position
 - total observation time
 - time range of observation
 - type of observation / priority
- already observed time for each source
- quality of past observations for each source
(weather and environmental conditions, results from analysis, hardware defects, ...)

Input Data 2

- general limits for observation (given per source
 - maximum zenith distance
 - minimum and maximum duration of one block of observation
 - minimum angle to the moon
- priorities of observation types
- position of sun and moon
- catalog with bright stars for tpoints
- date of last pointing model

Output data / Interfaces

- web pages showing
 - meta and nightly schedule in form of a list and graphically
 - zoomable
 - show fraction of observation times for each source for displayed period
 - show ratio of observed/scheduled observation time
- web page to update and insert new entries to the meta schedule
- nightly schedule

FACT Scheduler

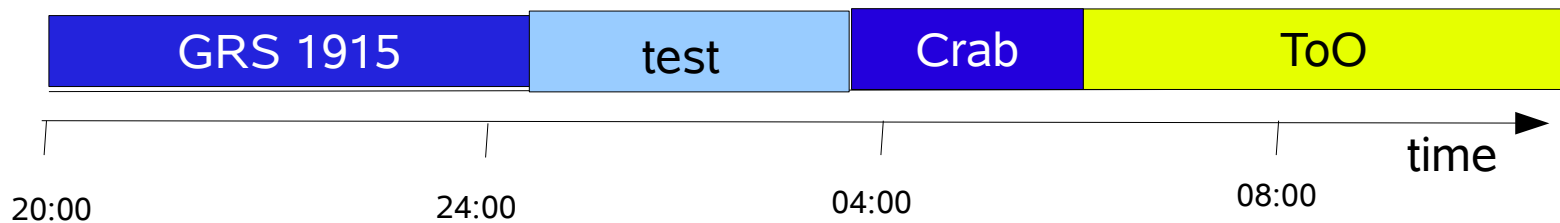
Standard observations

name	relative observation time	max zenith	duration minimum	duration maximum	min moon angle
GRS 1915	1	30	0.5h	3h	40
Crab	1.4	35	1 h	1.5h	30
X3	2.3	40	1.4h	4 h	22

name	type	RA	DEC	Start Time	End Time
V1X3	OoL	24.5	-30.8	24. 04. 2011 19:00:30	24. 04. 2011 23:34:40
	test			12. 03. 2011 03:00:00	13. 03. 2011 10:00:00
NWT4	MWL	248.90	23.45	03. 05. 2011 21:30:05	04. 05. 2011 03:24:39

FACT Scheduler

Source	Fraction of observation time
GRS 1915	0.3
test	0.25
Crab	0.15
ToO	0.3



How is Nightly Schedule defined?

- option A:
list of runs
 - run number
 - start time
 - stop time
 - sky position
 - run type (calibration, pedestal, data, none)
 - source type: TeV source, star for Tpoint
- option B:
list of time windows
 - start time
 - end time
 - sky position
 - source type: TeV source, star for Tpoint

Assumptions

- the scheduler does not take into account automatic alerts (e.g. GCN or online analysis). In the case of an alert, the meta schedule has to be adapted manually via the webinterface
- observation types ordered by priority: MWL, ToO, Standard, Test
- The meta schedule does not contain any configuration information. In case of specific tests, time can be blocked in the scheduler. But the test runs are started directly from the run-gui.

Requirements Scheduler

- distribute the available observation time as equally as possible to a few sources
- schedule high priority observation (e.g. MWL, ToO) with a fixed time window
- schedule tpoints for the time in which no source can be observed

Requirements Scheduler 2

- schedules for at most 1 year in advance
- take into account visibility of all scheduled sources (for at least 6 months)
- possible to recalculate schedule of already partially measured night
- perform reschedule
 - at the beginning of each night (taking into account the quality information from the previous nights)
 - when new high priority observation is inserted
- calculation of new schedule within < 10 sec

Requirements Scheduler 3

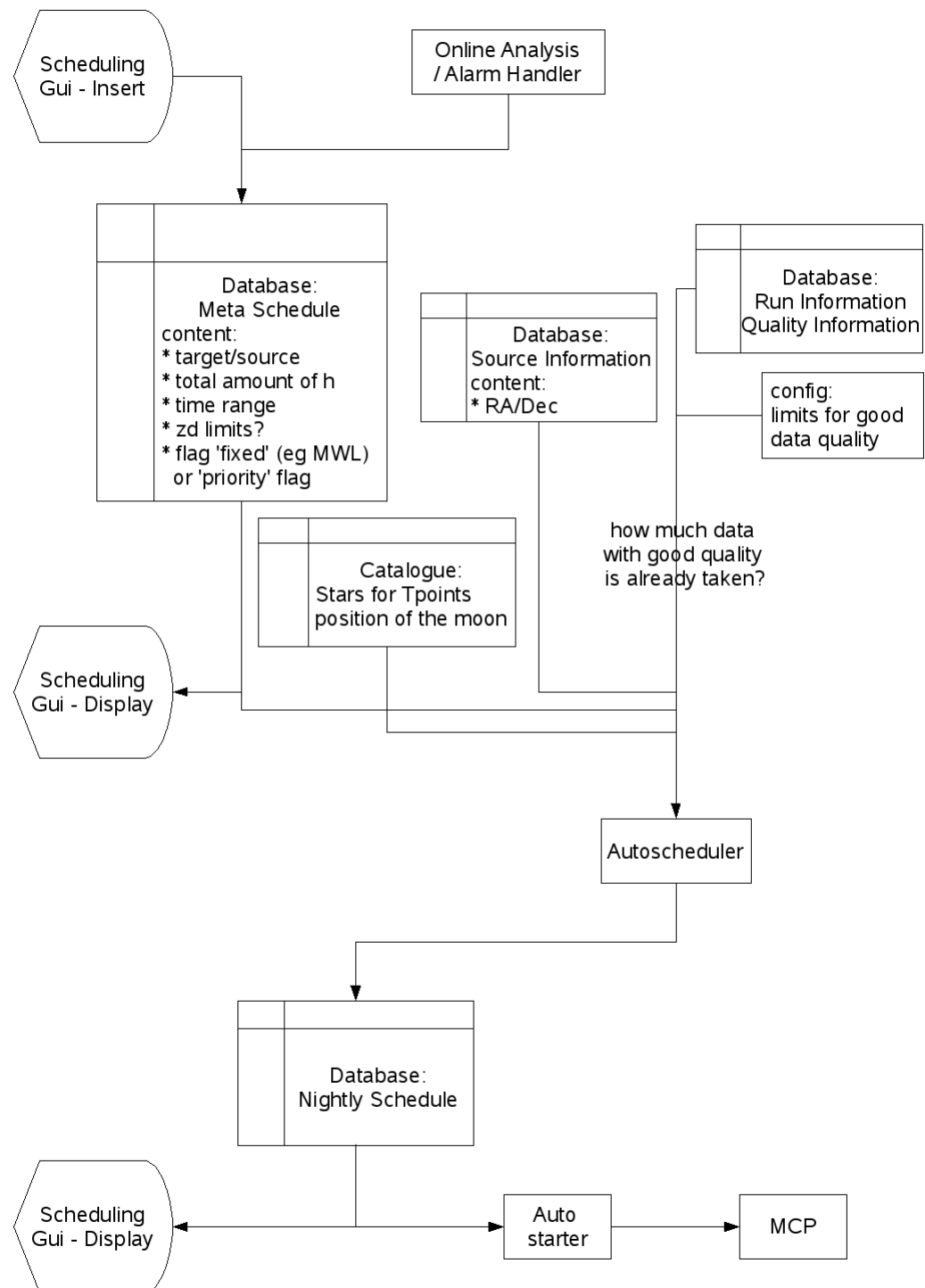
- duration of one observation block
> duration_min and < duration_max
- if possible ($z_d < z_{d_max}$), each source should be observed each night
- take into account angle to the moon
- z_d as small as possible, but > 1 deg
- schedule tpoints, when not TeV obs possible
 - > 200 per given time period (e.g. 1 month)
 - distributed equally over the sky
 - chosen such that repositioning time minimal

Requirements Scheduler 4

- take into account repositioning times
- take into account priorities of different observations (priorities are defined by the user and might be updated)
- for high priority observations, give warning in case of overlap of two or more observations
- give warning, if observation with fixed time window is not possible
- in case of overlap of high priority observations, split time equally

General Requirements

- it must be possible to update the meta schedule and the limits which are used to calculate the nightly schedule
- store the user name of the user who changed the meta schedule in the database



Open Questions (requirements)

- How is the meta schedule defined?
- How is the nightly schedule defined?
- Does the user want to insert new sources from some interface to the database?
- Who is responsible for the autostarter?

Open Questions (design)

- how to define the limits for the position of the moon?
- Tpoints
 - do we have to stop observing at a certain level of light? (how much time will there be for tpoints?)
 - should stars for tpoints be in source list (database) or taken from catalog?
(connection to definition of nightly schedule)
- concept for quality flag(s)